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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
ALEJANDRO MULERO, LUZ L	
ART UNIT	**PAPER NUMBER**
1763	

DATE MAILED: 08/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/762,985	BECKER ET AL.	
	Examiner	Art Unit	
	Luz L. Alejandro	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 June 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *31-45,47-71 and 74* is/are pending in the application.

4a) Of the above claim(s) *31-41* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *42-45, 47-71, 74* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 42-45 and 47-71 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The specification, as originally filed, fails to provide support for the limitation "without measuring the ratio of magnitudes of applied and reflected power of the generator" as required by the newly amended independent claim 42. Nothing in the specification would reasonably convey to one skilled in the art that the claimed measurement steps are not performed.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 74 is rejected under 35 USC 103(a) as being as obvious over Kadomura, U.S. Patent 5,662,819 in view of Collins et al., U.S. Patent 6,217,785, Wilbur, U.S. Patent 6,020,794, and Koshimizu, U.S. Patent 5,997,687.

Kadomura shows the invention as claimed including a method for etching a silicon body substrate using an inductively coupled plasma comprising an ICP source 52 for generating a radio-frequency electromagnetic alternating field, a reactor (51,57) for generating the inductively coupled plasma from reactive particles by the action of the radio-frequency electromagnetic alternating field on a reactive gas, and a first means for generating plasma power pulses (see abstract) to be injected into the inductively coupled plasma by the ICP source, the method comprising the step of injecting a pulsed radio-frequency power into the inductively coupled plasma as a pulsed plasma power (see figs. 4-6 and their description).

Kadomura fails to expressly disclose matching an impedance of one of an inductive coupled plasma and the ICP source to an ICP coil generator. Collins et al. discloses utilizing a matching circuit 34 to match the impedance of the ICP coil generator 30 with the ICP source 20 (see col. 3-lines 1-18). In view of this disclosure, it

would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Kadomura so as to match the impedance of the ICP coil generator with the ICP source as suggested by Collins et al. because this will maximize the efficiency of power coupling to the ICP source.

Concerning the oscillator feedback loop being a Meissner oscillator, apparatus limitations, unless they affect the process in a manipulative sense, may have little weight in process claims. *In re Tarczy-Hornoch* 158 USPQ 141, 150 (CCPA 1968); *In re Edwards* 128 USPQ 387 (CCPA 1961); *Stalego v. Heymes* 120 USPQ 473, 478 (CCPA 1959); *Ex parte Hart* 117 USPQ 193 (PO BdPatApp 1957); *In re Freeman* 44 USPQ 116 (CCPA 1940); *In re Sweeney* 72 USPQ 501 CCPA 1947).

Kadomura and Collins et al. do not expressly disclose wherein the ICP coil generator causes a variation of the frequency of the radio-frequency electromagnetic alternating field so that the impedance is matched as a function of the pulsed plasma power to be injected, so as to provide rapid switching between the plasma power pulses and interpulse periods, wherein the variation of the frequency is automatically performed by an osciallator feedback loop between the ICP coil and the ICP coil generator. Wilbur discloses wherein the ICP coil generator 13 causes a variation of the frequency of the radio-frequency alternating field so that the impedance within the plasma chamber is matched by an oscillator feedback loop (see reference number 20) between the ICP coil and the ICP coil generator (see abstract and fig. 1 and its description). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Kadomura

modified by Collins et al. so as to perform the impedance matching of Wilbur because this will improve the power efficiency of the plasma apparatus.

Kadomura, Collins et al. and Wilbur are applied as above but fail to expressly disclose wherein the pulsing of the radio-frequency power is accompanied by a change of the frequency of the injected radio-frequency power, the frequency change being controlled in such a way that the plasma power injected into the inductively coupled plasma during the pulsing is maximized. Koshimizu discloses shifting the frequency higher during pulse plasma processing to enhance the ignition of the plasma (see abstract). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Kadomura modified by Collins et al. and Wilbur so as to shift the frequency of the pulses higher as suggested by Koshimizu in order to improve the ignition of the plasma.

Furthermore, note that the apparatus of Kadomura modified by Collins et al., Wilbur, and Koshimizu will avoid high reflected powers back into the ICP coil generator when the plasma power is pulsed.

Claim 74 is rejected under 35 USC 103(a) as being unpatentable over Savas, WO 97/14177 in view of Collins et al., U.S. Patent 6,217,785, Wilbur, U.S. Patent 6,020,794, and Koshimizu, U.S. Patent 5,997,687.

Savas shows the invention as claimed including a method for etching a silicon body substrate using an inductively coupled plasma comprising an ICP source (150a, 150b) for generating a radio-frequency electromagnetic alternating field, a reactor 100

for generating the inductively coupled plasma from reactive particles by the action of the radio-frequency electromagnetic alternating field on a reactive gas, and a first means for generating plasma power pulses to be injected into the inductively coupled plasma by the ICP source, the method comprising the step of injecting a pulsed radio-frequency power into the inductively coupled plasma as a pulsed plasma power (see fig. 1 and page 6, line 10 to page 13, line 19).

Savas does not expressly disclose matching an impedance of one of an inductive coupled plasma and the ICP source to an ICP coil generator. Collins et al. discloses utilizing a matching circuit 34 to match the impedance of the ICP coil generator 30 with the ICP source 20 (see col. 3-lines 1-18). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Savas so as to match the impedance of the ICP coil generator with the ICP source as suggested by Collins et al. because this will maximize the efficiency of power coupling to the ICP source.

Savas and Collins et al. do not expressly disclose wherein the ICP coil generator causes a variation of the frequency of the radio-frequency electromagnetic alternating field so that the impedance is matched as a function of the pulsed plasma power to be injected, so as to provide rapid switching between the plasma power pulses and interpulse periods. Wilbur discloses wherein the ICP coil generator 13 causes a variation of the frequency of the radio-frequency alternating field so that the impedance within the plasma chamber is matched by an oscillator feedback loop (see reference number 20) between the ICP coil and the ICP coil generator (see abstract and fig. 1 and

its description). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Savas modified by Collins et al. so as to perform the impedance matching of Wilbur because this will improve the power efficiency of the plasma apparatus.

Savas, Collins et al. and Wilbur are applied as above but fail to expressly disclose wherein the pulsing of the radio-frequency power is accompanied by a change of the frequency of the injected radio-frequency power, the frequency change being controlled in such a way that the plasma power injected into the inductively coupled plasma during the pulsing is maximized. Koshimizu discloses shifting the frequency higher during pulse plasma processing to enhance the ignition of the plasma (see abstract). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Savas modified by Collins et al. and Wilbur so as to shift the frequency of the pulses higher as suggested by Koshimizu in order to improve the ignition of the plasma.

Concerning the oscillator feedback loop being a Meissner oscillator, apparatus limitations, unless they affect the process in a manipulative sense, may have little weight in process claims. *In re Tarczy-Hornoch* 158 USPQ 141, 150 (CCPA 1968); *In re Edwards* 128 USPQ 387 (CCPA 1961); *Stalego v. Heymes* 120 USPQ 473, 478 (CCPA 1959); *Ex parte Hart* 117 USPQ 193 (PO BdPatApp 1957); *In re Freeman* 44 USPQ 116 (CCPA 1940); *In re Sweeney* 72 USPQ 501 CCPA 1947).

Furthermore, note that the apparatus of Savas modified by Collins et al., Wilbur, and Koshimizu will avoid high reflected powers back into the ICP coil generator when the plasma power is pulsed.

Claim 74 is rejected under 35 USC 103(a) as being unpatentable over Koshimizu, U.S. Patent 5,935,373 in view of Collins et al., U.S. Patent 6,217,785, Wilbur, U.S. Patent 6,020,794, and Koshimizu, U.S. Patent 5,997,687.

Koshimizu '373 shows the invention as claimed including a method for etching a silicon body substrate using an inductively coupled plasma comprising: an ICP source 118 for generating a radio-frequency electromagnetic alternating field, a reactor 102 for generating the inductively coupled plasma from reactive particles by the action of the radio-frequency electromagnetic alternating field on a reactive gas, and a first means for generating plasma power pulses 154 to be injected into the inductively coupled plasma by the ICP source, the method comprising the step of injecting a pulsed radio-frequency power into the inductively coupled plasma as a pulsed plasma power (see figs. 1-3B and their description).

Koshimizu '373 does not expressly disclose matching an impedance of one of an inductive coupled plasma and the ICP source to an ICP coil generator. Collins et al. discloses utilizing a matching circuit 34 to match the impedence of the ICP coil generator 30 with the ICP source 20 (see col. 3-lines 1-18). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Koshimizu '373 so as to match the impedance of the ICP

coil generator with the ICP source as suggested by Collins et al. because this will maximize the efficiency of power coupling to the ICP source.

Koshimizu '373 and Collins et al. are applied as above but fail to expressly disclose wherein the ICP coil generator causes a variation of the frequency of the radio-frequency electromagnetic alternating field so that the impedance is matched as a function of the pulsed plasma power to be injected, so as to provide rapid switching between the plasma power pulses and interpulse periods. Wilbur discloses wherein the ICP coil generator 13 causes a variation of the frequency of the radio-frequency alternating field so that the impedance within the plasma chamber is matched by an oscillator feedback loop (see reference number 20) between the ICP coil and the ICP coil generator (see abstract and fig. 1 and its description). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Koshimizu '373 modified by Collins et al. so as to perform the impedance matching of Wilbur because this will improve the power efficiency of the plasma apparatus.

Koshimizu, '373, Collins et al. and Wilbur are applied as above but fail to expressly disclose wherein the pulsing of the radio-frequency power is accompanied by a change of the frequency of the injected radio-frequency power, the frequency change being controlled in such a way that the plasma power injected into the inductively coupled plasma during the pulsing is maximized. Koshimizu '687 discloses shifting the frequency higher during pulse plasma processing to enhance the ignition of the plasma (see abstract). In view of this disclosure, it would have been obvious to one of ordinary

skill in the art at the time the invention was made to modify the process of Koshimizu '373 modified by Collins et al. and Wilbur so as to shift the frequency of the pulses higher as suggested by Koshimizu '687 in order to improve the ignition of the plasma.

Concerning the oscillator feedback loop being a Meissner oscillator, apparatus limitations, unless they affect the process in a manipulative sense, may have little weight in process claims. *In re Tarczy-Hornoch* 158 USPQ 141, 150 (CCPA 1968); *In re Edwards* 128 USPQ 387 (CCPA 1961); *Stalego v. Heymes* 120 USPQ 473, 478 (CCPA 1959); *Ex parte Hart* 117 USPQ 193 (PO BdPatApp 1957); *In re Freeman* 44 USPQ 116 (CCPA 1940); *In re Sweeney* 72 USPQ 501 CCPA 1947).

Furthermore, note that the apparatus of Koshimizu '373 modified by Collins et al., Wilbur, and Koshimizu will avoid high reflected powers back into the ICP coil generator when the plasma power is pulsed.

Response to Arguments

Applicant's arguments with respect to claims 42-45 and 47-71 have been considered but are not deemed persuasive. Applicant argues that the rejection under 35 USC 112, first paragraph of claims 42-45 and 47-71 is improper. However, the examiner respectfully contends that the negative limitation does not have support in the specification, as originally filed, and any negative limitation or exclusionary provision must have basis in the original disclosure (see MPEP 2173.05(i)). For at least these reasons, the rejection is maintained.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luz L. Alejandro whose telephone number is 571-272-1430. The examiner can normally be reached on Monday to Thursday from 7:30 to 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Luz L. Alejandro
Primary Examiner
Art Unit 1763

August 21, 2006